What is claimed is:

1. An optical inspection system for inspecting the surface of a substrate, comprising:

a light source for emitting an incident light beam along an optical axis;

a first set of optical elements arranged for separating the incident light beam into a plurality of light beams, directing the plurality of light beams to intersect with the surface of the substrate, and focusing the plurality of light beams to a plurality of scanning spots on the surface of the substrate; and

a light detector arrangement including individual light detectors that correspond to individual ones of a plurality of reflected or transmitted light beams caused by the intersection of the plurality of light beams with the surface of the substrate, the light detectors being arranged for sensing the light intensity of either the reflected or transmitted light.

2. The optical inspection system as recited in claim 1 wherein the first set of optical elements is arranged for separating the incident light beam into a plurality of spatially distinct light beams, which are offset and staggered relative to one another.

3. The optical inspection system as recited in claim 1 wherein each of the plurality of light beams has about the same light intensity.

4. The optical inspection system as recited in claim 2 wherein the plurality of spatially distinct light beams consist of a first light beam, a second light beam and a third light beam, all of which have about the same light intensity.

5. The optical inspection system as recited in claim 4, wherein the first light beam has about a same angular scan rate as the incident light beam and the second and third light beams have a different and non-linear scan rate relative to the incident light beam.

6. The optical inspection system as recited in claim 4 wherein the light detector arrangement includes a first light detector for detecting the first light beam and for generating a corresponding first scan signal, a second light detector for detecting the

second light beam and for generating a corresponding second scan signal, and a third light detector for detecting the third light beam and for generating a corresponding third scan signal.

7. The optical inspection system as recited in claim 2 further comprising a second set of optical elements adapted for collecting either a plurality of reflected light beams or a plurality of transmitted light beams caused by the intersection of the plurality of light beams with the surface of the substrate, wherein the second set of optical elements is arranged for collecting the plurality of spatially distinct light beams, which have intersected with the surface of the substrate, and for directing individual ones of the collected light beams to individual light detectors of the light detector arrangement.

8. The optical inspection system as recited in claim 7, wherein the first light beam has about a same angular scan rate as the incident light beam and the second and third light beams have a different and non-linear scan rate relative to the incident light beam and wherein either the reflected light beams or transmitted light beams are collected at scan rates corresponding to the scan rates of the first, second, and third light beams.

9. The optical inspection system as recited in claim 1 wherein the first set of optical elements comprises a beam deflector disposed along the first optical axis, the beam deflector being arranged for deflecting the light beam such that the scanning spots are caused to sweep across the surface of the substrate in substantially one direction from a first point to a second point.

10. The optical inspection system as recited in claim 9 wherein the beam deflector comprises an acousto-optic device for causing the light beam to be deflected over a relatively small angle, the angle being at least one of the factors for determining the scan length of each of the scanning spots.

11. The optical inspection system as recited in claim 10 wherein the scan lengths of each of the scanning spots are combined to produce a scanning swath.

12. The optical inspection system as recited in claim 10 wherein the first set of optical elements comprises a beam separator disposed along the first optical axis, the beam separator being arranged for separating the light beam into the plurality of light beams.

13. The optical inspection system as recited in claim 12 wherein the beam separator is a diffraction grating.

14. The optical inspection system as recited in claim 13 wherein the diffraction grating is arranged for separating the light beam into a plurality of spatially distinct light beams, which when focussed on the surface of the substrate produce a plurality of scanning spots which are offset and staggered relative to one another, and which cause a portion of the scan length of the scanning spots to overlap one another.

15. The optical inspection system as recited in claim 14 wherein the diffraction grating has a grating spacing and a grating rotation about the optical axis, and wherein each of the scanning spots has a specified overlap and separation that is controlled by the grating spacing and the grating rotation.

16. The optical inspection system as recited in claim 13 wherein the diffraction grating is selected from one of a transmission type grating or a reflective type grating.

17. The optical inspection system as recited in claim 16 wherein the transmission type grating is selected from one of a phase grating or an amplitude grating.

18. The optical inspection system as recited in claim 12 wherein the beam separator comprises a beam splitter cube.

19. The optical inspection system as recited in claim 1 wherein the first set of optical elements comprises a variable magnification subsystem disposed along the optical axis, the variable magnification subsystem being arranged for controlling the scanning spot size.

20. The optical inspection system as recited in claim 1 wherein the first set of optical elements comprises an objective lens disposed along the optical axis, the objective lens being arranged for focussing the plurality of beams onto the surface of the substrate.

21. The optical inspection system as recited in claim 1 further comprising a stage for carrying the substrate such that the surface of the substrate moves in at least two directions within an inspection plane.

22. A method of inspecting a surface of a substrate, comprising:

transporting the substrate in a first direction;

providing a first light beam;

separating the first light beam into a plurality of light beams;

focusing the plurality of light beams to a plurality of spatially distinct spots on the surface of the substrate;

sweeping the plurality of light beams so as to move the plurality of spatially distinct spots along the surface of the substrate in a second direction;

detecting the intensity of each of the plurality of light beams after their intersection with the surface of the substrate; and

generating a plurality of scan signals corresponding to the detected plurality of light beams.

23. An optical inspection system for inspecting a surface of a substrate, comprising:

a light source for emitting a light beam along an optical axis;

a diffraction grating disposed along the optical axis, the diffraction grating being arranged for separating the light beam into a plurality of light beams which are used to form scanning spots on the surface of the substrate, each of the scanning spots having a specified overlap and separation with respect to one another that is controlled by the grating spacing and the rotation of the diffraction grating about the optical axis.